REMARKS

Claims 19-28 and 31-36 are pending. Claims 1-18 have been canceled without prejudice or disclaimer, claims 29 and 30 have been withdrawn, and claims 30-36 have been added.

The Action does not indicate that the Information Disclosure Statement filed on July 5, 2001, was considered by the Examiner and that the certified copy of the priority document, which was filed on August 23, 2001, was received. It is respectfully requested that an Examiner-initialed copy of the 1449 form enclosed with that IDS and an acknowledgement of receipt of the priority document be provided to the undersigned.

Claims 14 and 18 were rejected under 35 U.S.C. § 112, second paragraph, for indefiniteness, and claims 1, 2, 6-10, and 12-14 were rejected under 35 U.S.C. § 103(a) for obviousness over a combination of U.S. Patent No. 6,542,533 to Parayanthal ("Parayanthal") and Applicants' Fig. 1 and associated description ("Fig. 1"). In addition, claims 14-18 were rejected for obviousness over a combination of Parayanthal, Fig. 1, and U.S. Patent No. 4,070,681 to Ichikawa et al. These rejections have been rendered moot by this Amendment, which has canceled those claims.

Claims 3-6, 11, and 19-28 were rejected for obviousness over a combination of Parayanthal, Fig. 1, and U.S. Patent No. 6,137,619 to Chen et al. ("Chen"). The rejections of claims 3-6 and 11 are moot as these claims have been canceled by this Amendment. The rejections of claims 19-28 cannot stand because the cited information fails to support a prima facie case of obviousness.

In accordance with the MPEP, three criteria must be met to establish a prima facie case of obviousness: the cited documents must teach or suggest all of the claim limitations; there must be some suggestion or motivation, either in the cited documents themselves or in the knowledge generally available to one of ordinary skill in the art, to have combined the teachings of the cited documents; and there must have been a reasonable expectation that the documents could have been successfully combined.

As explained below, the combination of Parayanthal, Fig. 1, and Chen does not teach all of the claim limitations. Moreover, the cited information would not have supplied any motivation to combine them as suggested by the Action. Finally, there

would have been no reasonable expectation that such complex information could be successfully combined to yield a working system, which even then would have had to be further modified to obtain the claimed subject matter.

Applicants' claim 19 defines an optical device that comprises a window region arranged between the output end of a modulator and a front facet of the device such that modulated light is transmitted through the window region and output through the front facet at an angle with respect to the normal to the front facet. Also, the output end of the modulator is tapered. This arrangement reduces internal reflections, as noted in the application at page 3, lines 25-27, for example.

Parayanthal, Fig. 1, and Chen could not have been combined in a way that would have provided all of the features of Applicants' claims. Internal reflections in laser-modulator devices can be reduced in many ways, for example, with anti-reflection coatings, window regions, or optical isolators. Parayanthal reduces internal reflections with a bent modulator and Fig. 1 depicts a window region, but none of the cited information discloses a tapered-end modulator. Thus, the cited information does not teach at least three features of claim 19: a window region, a modulator output angled with respect to the output surface, and a tapered modulator end.

The difference between Applicants' combination of features and the cited combination of information yielded an unexpected result that was recognized by Applicants: by combining the three features, internal reflections are reduced far more than would have been expected by the artisan. With a window region, light reflected at the output surface and coupled back into the waveguide is reduced due to the divergence of the light output from the modulator, as discussed at page 3, lines 9-11, of the application for example. With a modulator angled with respect to the output surface, light reflected at the output surface is, due to this angle, mostly deflected away from the waveguide output end, which suppresses reflection, as discussed at page 9, lines 23-27, of the application, for example. With a tapered modulator end, light reflected at the modulator output end is reduced due to the continuous expansion of the spot size over the tapered section. The reflection is suppressed by setting the length of the tapered section to a suitable value. This smearing out of the waveguide discontinuity over a distance is described in the

application at page 10, lines 1-2, for example. Also if the inclination angle is large, the amount of light coupled back into the modulator is low due to the large spot size.

In Applicants' device, reflections back into the modulator can be strongly suppressed, much more strongly than would possibly have been expected. The surprising effect discovered by Applicants when they combined these three features is that a window section between the modulator end and the output surface, which normally is used to reduce reflections thanks to the divergence of the light output from the modulator, operates in the reverse of the expected manner. The tapered modulator end provides not only for a larger spot size, i.e., a transversally expanded beam, but also for a smaller angular spread in the diffraction of the light output from the modulator. Thus, the tapered modulator end together with a modulator angled with respect to the output surface, and a window region in-between, operate jointly to direct a less divergent beam away from directions that would produce retro-reflections back into the modulator. This is described in the application at page 10, line 18 - page 11, line 9, and Fig. 3, for example.

It is further believed that Parayanthal, Fig. 1, and Chen disclose nothing that would motivate their combination and that the cited information could not have been successfully combined as suggested in the Action. In fact, the cited information teaches away from a combination like Applicants'. Since the operation of a window region was well known to rely on a divergent beam, consideration of a window region actually points away from a combination with a tapered modulator end for narrowing the beam. Thus, one of skill in the art would have had no motivation to combine the cited information and would have expected little if any success with the combination.

There are other features of Applicants' claims that are absent from the cited information, but it is believed unnecessary to discuss them in detail because the absences already discussed are sufficient to preclude rejection of the claims.

Thus, Parayanthal, Fig. 1, and Chen fail to support a prima facie case of obviousness with respect to claim 19 and its dependent claims. For the preceding reasons, it is respectfully requested that the obviousness rejections of claims 19-28 be reconsidered and withdrawn.

Further, the inventions defined by new claims 31-36 also would not have been obvious over the cited combination, and not merely because these claims depend from claim 19.

The invention defined by new claim 33, for example, features that (i) the front facet is angled with respect to the back facet and (ii) the angle between the propagation direction of the modulated light output from the modulator and the normal of the front facet and the angle between the front and back facets are such that light transmitted through the window region and output from the device propagates substantially perpendicularly to the back facet. An embodiment of this invention is illustrated in Fig. 4.

This arrangement solves a problem of layout and design. The designer is typically used to designing optical modules and optical transmitters in a linear fashion, but when trying to employ the reflection-reducing principles disclosed by Parayanthal, the light output from the device propagates at an angle with respect to the device. This causes problems for the designer in terms of alignment and space requirements, particularly when more optical components are downstream of the laser-modulator device. These downstream components are more difficult to align as one has no reference indicating the direction of the light output, and the module can become bulky if the distance between the modulator and the downstream components is large an/or if the output angle is large.

Applicants solve these problems with features (e.g., combining an angled front facet with a bent or diagonally arranged modulator) such that the light output is parallel to the normal to the back facet (and optionally to the laser and the sides of the laser-modulator device), a reference for alignment is obtained, and constructing narrow modules is enabled.

Neither Parayanthal, nor Fig. 1, nor Chen discloses anything whatsoever that would lead one skilled in the art to the inventions as claimed in new claims 31-36.

It is believed this application is in condition for allowance and an early Notice of same is earnestly solicited. If any questions remain, the Examiner is invited to phone the undersigned at the below-listed number.

Respectfully submitted,

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